1.Define the Bayesian interpretation of probability.

Ans.

The Bayesian interpretation of probability is a way of assigning a probability value to a hypothesis or event based on prior knowledge or experience. According to this interpretation, probability is a measure of the degree of belief in a hypothesis, which can be updated or revised as new evidence or information becomes available.

2.Define probability of a union of two events with equation.

Ans.

The probability of the union of two events A and B is given by the equation:

P(A ∪ B) = P(A) + P(B) - P(A ∩ B)

where P(A) and P(B) are the probabilities of events A and B, and P(A ∩ B) is the probability of their intersection.

3.What is joint probability? What is its formula?

Ans.

Joint probability is the probability of two or more events occurring together. It is denoted by P(A ∩ B) and is calculated using the formula:

P(A ∩ B) = P(A|B) x P(B) = P(B|A) x P(A)

where P(A|B) and P(B|A) are conditional probabilities of A given B and B given A, respectively.

4.What is chain rule of probability?

Ans.

The chain rule of probability is a way of calculating the joint probability of a set of events by multiplying the conditional probabilities of each event given its predecessors. It is given by the formula:

P(A1 ∩ A2 ∩ ... ∩ An) = P(A1) x P(A2|A1) x P(A3|A1 ∩ A2) x ... x P(An|A1 ∩ A2 ∩ ... ∩ An-1)

What is conditional probability means? What is the formula of it?

Conditional probability is the probability of an event A occurring given that another event B has occurred. It is denoted by P(A|B) and is calculated using the formula:

P(A|B) = P(A ∩ B) / P(B)

where P(A ∩ B) is the joint probability of events A and B, and P(B) is the probability of event B.

5.What are continuous random variables?

Ans.

Continuous random variables are variables that can take on any value within a certain range or interval, rather than being restricted to specific values. Examples include height, weight, and time.

6.What are Bernoulli distributions? What is the formula of it?

Ans.

Bernoulli distributions are probability distributions that model the outcome of a single binary event, such as flipping a coin or the success or failure of a single trial. It is characterized by a single parameter p, which represents the probability of success, and is given by the formula:

P(X = 1) = p

P(X = 0) = 1 - p

where X is the random variable representing the outcome, which can take on values of either 0 or 1.

7.What is binomial distribution? What is the formula?

Ans.

Binomial distribution is a probability distribution that models the number of successes in a fixed number of independent trials, where each trial has only two possible outcomes (success or failure). It is characterized by two parameters, n (the number of trials) and p (the probability of success in each trial), and is given by the formula:

P(X = k) = (n choose k) x p^k x (1 - p)^(n-k)

where X is the random variable representing the number of successes, k is a specific number of successes, (n choose k) is the binomial coefficient, and p^k and (1 - p)^(n-k) represent the probabilities of k successes and n-k failures, respectively.

8.What is Poisson distribution? What is the formula?

Poisson distribution is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time or space, given that the events occur independently and at a constant rate. It is often used to model rare events such as accidents, failures, or natural disasters.

The formula for Poisson distribution is:

P(X = k) = (e^-λ \* λ^k) / k!

where

X is the number of events

k is the number of events we want to calculate the probability for

λ is the average rate of events in the given interval

e is Euler's number (approximately 2.71828)

9.Define covariance.

Ans.

Covariance is a measure of how much two random variables vary together. It is a statistical term that measures the joint variability of two random variables. In other words, it measures how much two variables change together. If the two variables tend to increase or decrease together, then their covariance will be positive. If they tend to vary in opposite directions, their covariance will be negative. If they are independent, their covariance will be zero.

The formula for covariance between two random variables X and Y is:

cov(X,Y) = E[(X - E[X]) \* (Y - E[Y])]

where E[X] is the expected value of X, E[Y] is the expected value of Y, and the asterisk denotes multiplication.

10.Define correlation

Ans.

Correlation is a statistical measure that shows the relationship between two variables. It measures the strength and direction of the relationship between two variables. A positive correlation indicates that the two variables tend to move in the same direction, while a negative correlation indicates that the two variables tend to move in opposite directions. A correlation coefficient of 0 indicates that there is no relationship between the two variables.

The formula for correlation coefficient between two variables X and Y is:

r = cov(X,Y) / (σ\_X \* σ\_Y)

where cov(X,Y) is the covariance between X and Y, and σ\_X and σ\_Y are the standard deviations of X and Y, respectively.

11.Define sampling with replacement. Give an example.

Ans.

Sampling with replacement is a sampling technique where a unit or observation is selected from a population and then returned to the population before the next selection. In other words, each time a unit is selected, it is put back into the population before the next unit is selected.

For example, suppose a bag contains 5 balls, numbered 1 to 5. We randomly select a ball from the bag, record its number, and then put it back into the bag before selecting the next ball. We repeat this process 3 times. This is an example of sampling with replacement.

12.What is sampling without replacement? Give an example.

Sampling without replacement is a sampling technique where a unit or observation is selected from a population and then not returned to the population before the next selection. In other words, each time a unit is selected, it is removed from the population before the next unit is selected.

For example, suppose a bag contains 5 balls, numbered 1 to 5. We randomly select a ball from the bag, record its number, and then remove it from the bag before selecting the next ball. We repeat this process 3 times. This is an example of sampling without replacement.

13.What is hypothesis? Give an example.

Ans.

A hypothesis is a proposed explanation or prediction for an observable phenomenon or an educated guess about the relationship between variables. It is often used in scientific research and can be tested through experiments or observations.

Example: Let's say we want to investigate whether caffeine intake affects a person's reaction time. Our hypothesis could be: "Increased caffeine intake leads to a decrease in reaction time." We can then design an experiment to test this hypothesis, by having participants consume varying amounts of caffeine and measuring their reaction time. If our results support the hypothesis, we can conclude that there is a relationship between caffeine intake and reaction time.

14. What is conditional probability means? What is the formula of it?

Ans.

Conditional probability is the probability of an event A occurring given that another event B has occurred. It is denoted by P(A|B) and is calculated using the formula:

P(A|B) = P(A ∩ B) / P(B)

where P(A ∩ B) is the joint probability of events A and B, and P(B) is the probability of event B.